N° 7312 A.D. 1894

Date of Application, 12th Apr., 1894

Complete Specification Left, 12th Feb., 1895—Accepted, 23rd Mar., 1895

PROVISIONAL SPECIFICATION.

Improvements in or connected with Hospitals and in Means for Ventilating the same, and for Sterilizing the Air Escaping therefrom.

I, Michael Mary Brophy, of the Firm of James Slater & Co., of 251, High Holborn, in the County of London, Engineer, do hereby declare the nature of this invention to be as follows :—

My invention relates to hospitals and especially those for the treatment of infectious diseases and the chief object of my invention is to provide means whereby a thorough ventilation shall be maintained and whereby the air escaping therefrom shall be sterilized before passing into the atmosphere, thereby preventing a hospital being a centre for the dissemination of diseases as is now sometimes the case.

A hospital to which my invention is applied must be so constructed that there shall be no openings through which air from the ward can directly pass out and for this purpose I prefer to make the windows so that they cannot be opened and the walls, floors, ceilings and fittings of the wards should be of such material and construction that the air in such wards may from time to time (for the purpose of purification) be raised to a very high temperature, say, for instance, 700 or 800 degrees without any possibility of taking fire or being damaged by the heat.

In connection with each ward is a flue into which the vitiated air from the ward can pass through one or more openings, the said flue entending to a furnace or stove having a temperature of say 1500 to 2000 degrees, the air being drawn or forced from the ward through this furnace or stove either by a chimney draught, a blower, injector jets or other suitable means whereby it is sterilized. This suction flue must be so arranged and constructed that it also may be raised to a very high temperature without the risk of being injured or causing injury owing to the high temperature within it.

In order to produce the necessary heat for sterilizing the air I prefer to make use of gaseous fuel, using any suitable gas producer, and this gas producer I arrange in conjunction with a series of regenerator stoves preferably of the vertical type such, for instance as the "Cowper" regenerator stove, which stoves cause the air passing through them to be broken up into small currents and so ensure that every particle of air shall be heated to the desired extent.

In practice I find it advantageous to use four of such stoves each of which can be placed in communication with the others with the gas-producer, the suction flue and the chimney flue as desired. Only three, however, of such stoves would be heated at one time, the other being idle.

The method of using these regenerator stoves would be somewhat as follows :— One of them being heated to the desired temperature the air from the ward would be drawn down therethrough and so sterilized, the heated sterilized air passing into another stove and giving up its heat therein before passing to the chimney at a temperature only sufficiently high to produce the necessary chimney draught whilst at the same time the third stove is being heated by the gas-producer. When the stove, through which the air is being drawn, is cooled to a certain extent the valves, which are provided for the purpose, are moved to cause the air to flow through one of the other stoves, it being understood that one stove is always being heated directly by the gas-producer, another cooled by the air to be sterilized

[*Price* 8*d*.]

passing through it and another heated by the escaping hot sterilized air, the fourth stove serving to take the place of either of the others in case of necessity.

In order that any germs which may be deposited in the suction flue between the ward and the sterilizing stoves may be destroyed from time to time, I pass through the suction flue from the stoves to the opening or openings in the ward a tube or flue through which hot air may be caused to pass direct from the stoves to the top of the flue from which point it returns through the suction flue at a sufficient temperature to destroy any germs therein. This tube also serves for delivering hot air directly into the ward in order to heat the same to a temperature sufficiently high to destroy all germs, the fire-proof construction of the building hereinbefore referred to permitting this to be done.

It is obvious that the dimensions of the flues and of the apparatus must be proportioned to the quantity of air to be sterilized and that suitable inlet openings must be formed in the ward walls to permit of fresh air being introduced without draught at the same rate that the vitiated air is withdrawn. The desired temperature of the incoming air can be maintained by suitable heating or cooling apparatus through which the incoming air has to pass.

In order that no vitiated air from the ward shall escape into the staircases or passages of the hospital I arrange suitable openings through which the air from such staircases or passages shall be drawn into the ward or into the suction flue.

An arrangement of apparatus such as hereinbefore described may, if of suitable capacity, be arranged to sterilize the air from several wards and, if the heat produced is greater than that required for the sterilization of the air, the surplus heat may be employed for heating or cooking purposes or for the production of steam.

Dated this 12th day of April 1894.

G. F. REDFERN & Co.,
4, South Street, Finsbury, London, Agents for the Applicant.

COMPLETE SPECIFICATION.

Improvements in or connected with Hospitals and in Means for Ventilating the same, and for Sterilizing the Air Escaping therefrom.

I, Michael Mary Brophy, of the Firm of James Slater & Co., of 251, High Holborn, in the County of London, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

My invention relates to hospitals and especially those for the treatment of infectious diseases and the chief object of my invention is to provide means whereby a thorough ventilation of the wards shall be maintained and whereby the air escaping therefrom shall be sterilized before passing into the atmosphere, thereby preventing a hospital being a centre for the dissemination of diseases as is now sometimes the case.

A hospital to which my invention is applied must be so constructed that there shall be no openings through which air from the ward can directly pass out and for this purpose I prefer to make the windows so that they cannot be opened and the walls, floors, ceilings and fittings of the wards should be of such material and construction that the air in such wards may from time to time (for the purpose of purification) be raised to a very high temperature, say, for instance, 700 or 800 degrees Fahrenheit without any possibility of taking fire or being damaged by the heat.

In connection with each ward is a flue into which the vitiated air from the ward can pass through one or more openings, the said flue extending to a furnace or stove having a temperature of say 1500 to 2000 degrees, the air being drawn or forced from the ward through this furnace or stove either by a chimney draught, a blower, injector jets or other suitable means whereby it is sterilized. This eduction flue must be so arranged and constructed that it also may be raised to a very high temperature without the risk of being injured or causing injury owing to the high temperature within it.

In order to produce the necessary heat for sterilizing the air I prefer to make use of gaseous fuel, using any suitable gas producer, and this gas producer I arrange in conjunction with a series of regenerator stoves preferably of the vertical type such, for instance, as the "Cowper" regenerator stove, which stoves cause the air passing through them to be broken up into small currents and so ensure that every particle of air shall be heated to the desired extent.

In practice I find it advantageous to use four of such stoves each of which can be placed in communication with the others, with the gas producer, with the eduction flue and the chimney flue as desired. Only three, however, of such stoves would be used at one time, the other being idle.

In order that any germs which may be deposited in the eduction flue between the ward and the sterilizing stoves may be destroyed from time to time, I pass through or alongside the eduction flue from the stoves to the opening or openings in the ward a tube or flue through which hot air may be caused to pass direct from the stoves to the top of the flue from which point it returns through the eduction flue at a sufficient temperature to destroy any germs therein. This tube also serves for delivering hot air directly into the ward when it is required to purify it in order to heat the same to a temperature sufficiently high to destroy all germs, the fire-proof construction of the building hereinbefore referred to permitting this to be done.

To enable my invention to be fully understood I will describe the same by reference to the accompanying drawings, in which:—

Figure 1 is a sectional elevation illustrating an arrangement of regenerator stoves and flues suitable for carrying my invention into practice; and,

Figure 2 is a sectional plan of the same.

a indicates the ward or chamber from which the escaping air is to be sterilized and the windows b, b of which are preferably formed so that they cannot be opened to establish direct communication between the interior of the ward and the external atmosphere, and the walls, floors, ceilings and fittings of which are of such material and construction that they cannot be damaged by the heat to which the interior of the ward is to be subjected as hereinbefore mentioned.

b^1, b^2, b^3, b^4 indicate a range of four regenerator stoves each of which communicates by a passage c with a flue c^1 from which extend branch flues c^2, c^2 with openings c^3 in the walls of the ward and also by means of a passage d with a flue d^1 common to all the stoves of the range. e is a gas supply flue, and e^1, e^1 are branches of the same which communicate with the several regenerator stoves. f, f are passages which establish communication between the regenerator stoves and a flue f^2 common to all the stoves and extending to a chimney shaft or arranged in connection with other devices or apparatus for inducing the draught. g is a branch flue from the main flue c^1, the said branch flue being connected with the several regenerator stoves by pipes g^1, g^1 which serve to convey some of the vitiated air to the heating burners of the regenerator stoves for supporting the combustion of the gas. h is a hot air pipe or flue which preferably extends through or alongside the main flue c^1 and is provided with branches h^1, h^1 which extend to openings h^2, h^2 formed in the eduction flues c^2 near the points at which they communicate with the ward, the said hot air pipe or flue h also communicating by branches h^3 with the several regenerator stoves.

The several passages c, d, e^1, f, g^1, h^3 of each regenerator stove are provided with valves i, i^1, i^2, i^3, i^4, i^5 respectively and the branch flues c^2 and h^1 are provided with valves j, j^1 respectively. Doors or valves k are also arranged in conjunction with the several openings c^3 between the flues c^2 and the ward.

The operation of the apparatus hereinbefore described is as follows :—

Assume the regenerator stove b^1 to have been heated to the required extent by means of gas admitted by opening the valve i^2 (the air for supporting the combustion of which is admitted through the valve i^4) the valve i^3 in the passage f being opened in order to allow the escaping products of combustion to enter the chimney and to create a draught therein : if now the valves i^2, i^3 and i^4 of the stove b^1 are closed and the valves i, i^1 of the stove b^1 and the valves i^1, i^3 of the stove b^2 are opened, air will be drawn from the ward through the openings c^3 into the branch eduction flues c^2, thence into the main flue c^1, thence into the heated regenerator stove b^1, whereby the air will be sterilized, and thence through the pipes d, d into the stove b^2 in which the sterilized air will give up the greater part of the heat which it contains before escaping into the chimney through the passage f.

During the time that the stove b^1 is cooling by the passage of the air from the ward through it and the stove b^2 is heating by the passage of the heated sterilized air through it, the stove b^3 is being heated by gas. By the time that the stove b^1 is cooled to such an extent that it will no longer sterilize the air passing through it the stove b^3 has been sufficiently heated ; the valve i of the stove b^1 is then closed and the valves i, i^1 of the stove b^3 and the valve i^3 of the stove b^1 are opened, so that the air is drawn from the ward through the stove b^3 in which the air is sterilized and the stove b^1 in which the sterilized air parts with the major portion of its heat ; in the meantime gas has been applied to the stove b^2 to supplement the heat due to that which was imparted to it by the passage of the heated air, so that by the time the stove b^3 has cooled the stove b^2 is ready to have the air drawn through from the ward. Whilst the air is being drawn through the stove b^2 the hot air escaping therefrom passes through the stove b^3, the heat of the stove b^1 being supplemented by gas heat. When the stove b^1 is sufficiently heated the air from the ward is again drawn through it and so the operation of the apparatus is continually maintained, one stove being heated directly by gas, another being cooled by the passage of the air from the ward through it and the third being partially heated by the sterilized air escaping from the cooling stove.

By providing four stoves as shewn in the drawings I am enabled to keep one stove always out of action for repairs or for any other reason as may be desired.

If it is desired at any time to burn out the eduction flues c^2, c^1 the doors or valves k over the openings c^3 are closed and the valves j^1 of the hot air flues h, h are opened, as also is the valve i^5 of the branch h^3 connected with the stove from which the heat is to be obtained, say, for instance, the stove b^1 ; if now the air is exhausted through the eduction flue c^1, say through the stove b^2 as hereinbefore described (no air being able to pass from the ward through the openings c^3) air will be drawn from the stove b^1 in a highly heated condition and delivered into the flues c^2 through the openings h^2. If instead of burning out the flues it is desired to burn out the interior of the ward, then the valves j, j in the branch flue c^2 in connection with one side of the ward are closed and the valves j^1 in the hot air flue of the same side are opened, whereby air will be exhausted from the ward through the openings at one side thereof whilst hot air will enter the ward through the openings at the other side.

It is obvious that the dimensions of the flues and of the apparatus must be proportioned to the quantity of air to be sterilized and that suitable inlet openings must be formed in the ward walls to permit of fresh air being introduced without draught at the same rate that the vitiated air is withdrawn. The desired temperature of the incoming air can be maintained by suitable heating or cooling apparatus through which the incoming air has to pass.

An arrangement of apparatus such as hereinbefore described may, if of suitable capacity, be arranged to sterilize the air from several wards, and, if the heat produced is greater than that required for the sterilization of the air, the surplus heat may be employed for heating or cooking purposes or for the production of steam.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. The improvements in the construction of hospitals consisting in the provision of means whereby the vitiated air removed from the wards for the purpose of ventilating the same is caused to pass through a heated chamber or furnace before escaping to the atmosphere whereby such air is sterilized, substantially as described.

2. In a hospital the arrangement of an eduction flue or flues leading from openings in the walls of the ward to a series of regenerator or other furnaces through either of which the vitiated air drawn from the ward may be passed, a heating flue or passage being arranged in conjunction with the eduction flue or flues for conveying hot air from one of the regenerator stoves into the eduction flues or into the ward, substantially as, and for the purposes, described.

3. The combination with a hospital having eduction flues through which the air is exhausted from the wards, of a series of regenerator stoves arranged and operating substantially as described.

Dated this 12th day of February 1895.

G. F. REDFERN & Co.,
4, South Street, Finsbury, London, Agents for the Applicant.

London : Printed for Her Majesty's Stationery Office by Darling & Son, Ltd.—1895

WELLCOME LIBRARY INSTITUTE

[This Drawing is a reproduction of the Original on a reduced scale]

(2 SHEETS)
SHEET 1.

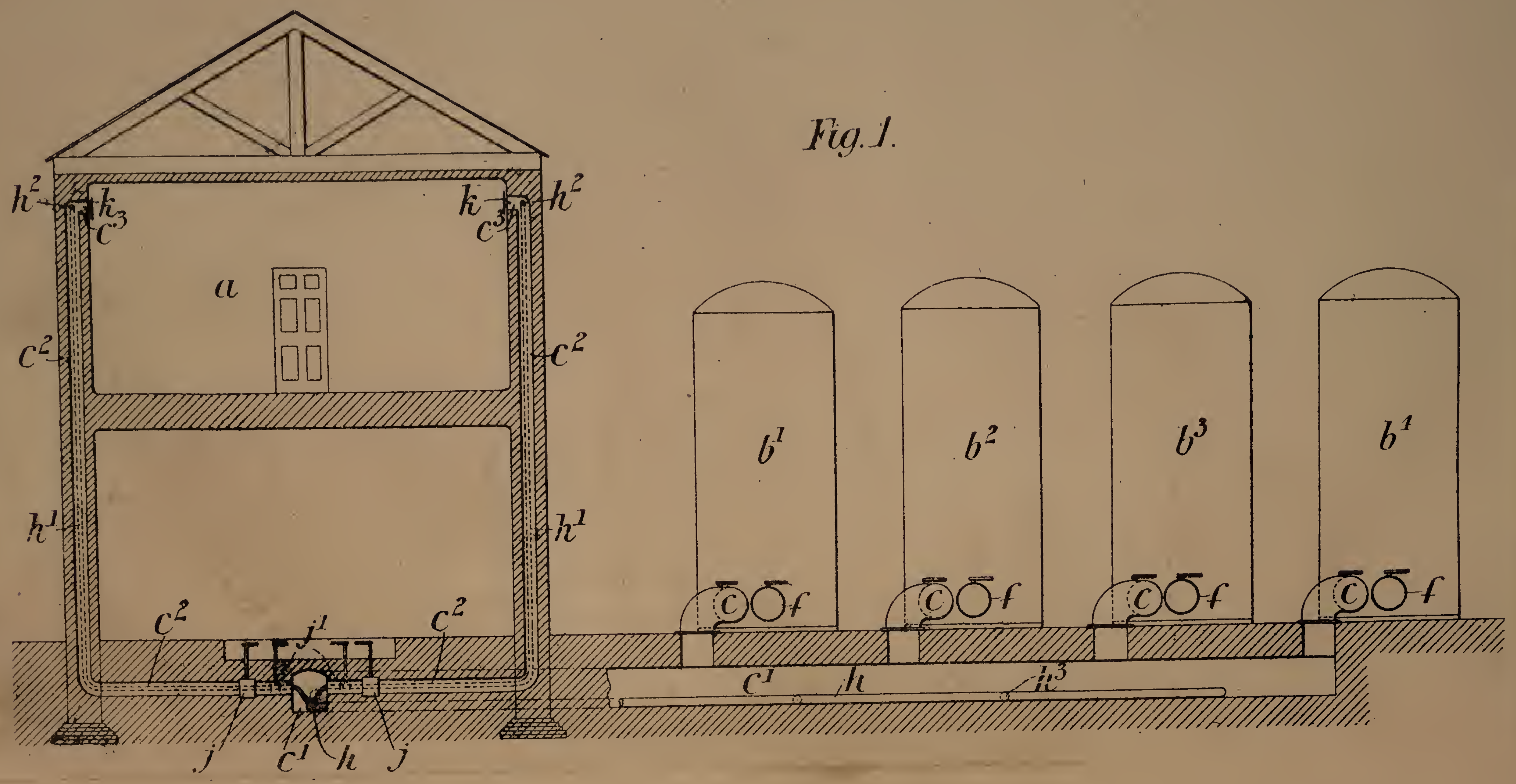

Fig. 1.

SHEET 2.

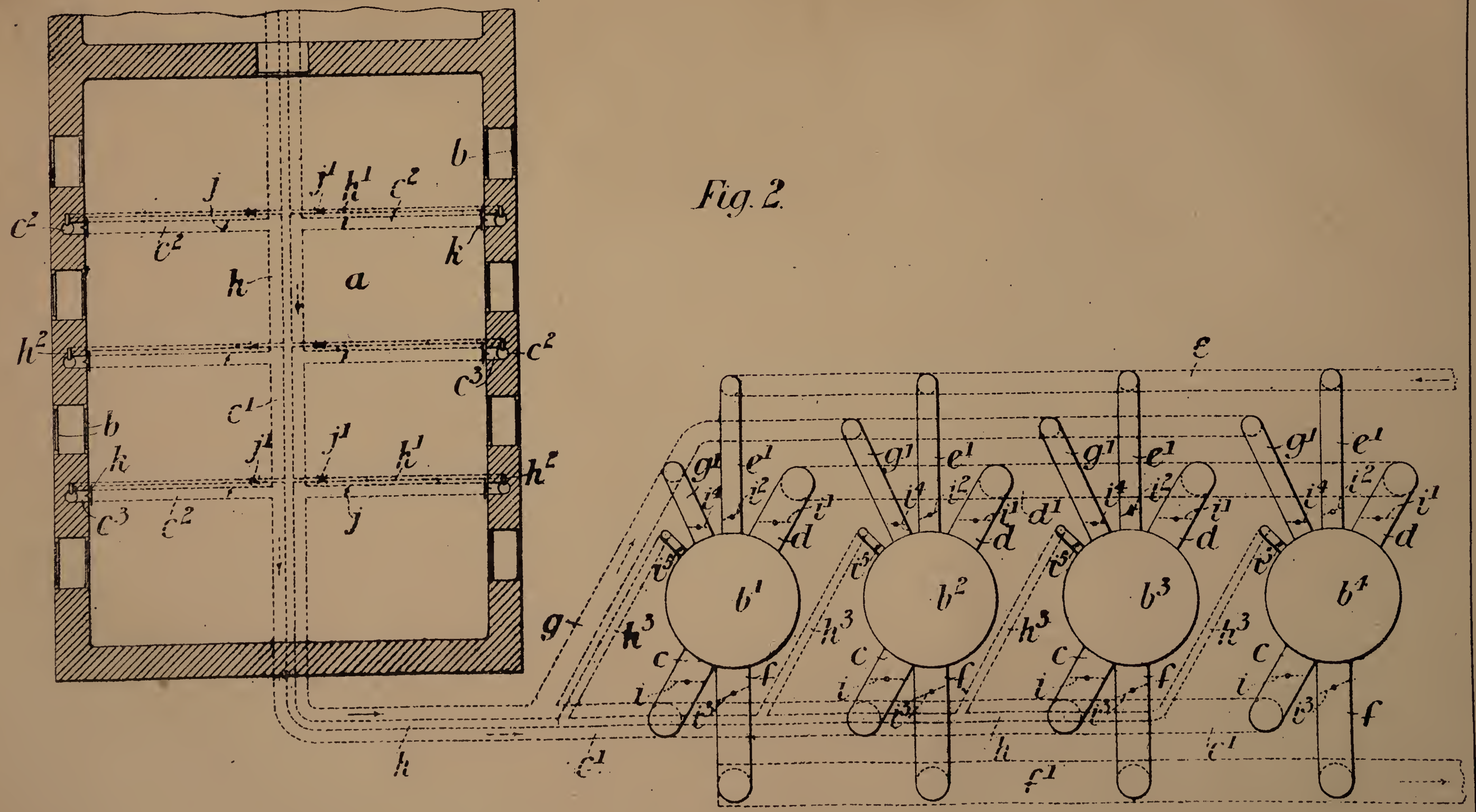

Fig. 2.

A.D. 1894. April 12. No. 7312.
BROPHY'S COMPLETE SPECIFICATION.

London. Printed by Darling and Son Ld.
for Her Majesty's Stationery Office. 1895.

Malby & Sons, Photo-Litho.